

**TRANSMITTAL LETTER TO THE UNITED STATES  
DESIGNATED/ELECTED OFFICE (DO/EO/US)  
CONCERNING A FILING UNDER 35 U.S.C. 371**

INTERNATIONAL APPLICATION NO.

PCT/AU00/00657

INTERNATIONAL FILING DATE

09 June 2000

U.S. APPLICATION NO. (If known, see 37 CFR 1.16)

10/009908

PRIORITY DATE CLAIMED

10 June 1999

TITLE OF INVENTION

POWER SAVING LEADS STATUS MONITORING

APPLICANT(S) FOR DO/EO/US

PLATT, Harry Louis; JANKOV, Vladimir

\*\*\*SMALL ENTITY STATUS APPLICABLE\*\*\*

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1.  This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.
2.  This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
3.  This express request to begin national examination procedures (35 U.S.C. 371(f)) at any time rather than delay examination until the expiration of the applicable time limit set in 35 U.S.C. 371(b) and PCT Articles 22 and 19(1).
4.  A proper Demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date.
5.  A copy of the International Application as filed (35 U.S.C. 371(c)(2))
  - a.  is transmitted herewith (required only if not transmitted by the International Bureau).
  - b.  has been transmitted by the International Bureau.
  - c.  is not required, as the application was filed in the United States Receiving Office (RO/US).
6.  A translation of the International Application into English (35 U.S.C. 371(c)(2)).
7.  Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3))
  - a.  are transmitted herewith (required only if not transmitted by the International Bureau).
  - b.  have been transmitted by the International Bureau.
  - c.  have not been made; however, the time limit for making such amendments has NOT expired.
  - d.  have not been made and will not be made.
8.  A translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).
9.  An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)).
10.  A translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)).

Items 11. to 16. below concern other document(s) or information included:

11.  An Information Disclosure Statement under 37 CFR 1.97 and 1.98.
12.  An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
13.  A **FIRST** preliminary amendment.  
 A **SECOND** or **SUBSEQUENT** preliminary amendment.
14.  A substitute specification.
15.  A change of power of attorney and/or address letter.
16.  Other items or information: International Preliminary Examination Report  
"Express Mail" mailing label number ET 670106897 US  
Date of Deposit December 10, 2001

I hereby certify that this paper is being deposited with the U.S. Postal Service "Express Mail-Post Office to Addressee" service under 37 C.F.R. 1.10 on the date indicated above and is addressed to: Hon. Commissioner of Patents and Trademarks, Washington, D. C. 20231.

December 10, 2001

Edwin D. Schindler, Reg. No. 31,459

Date

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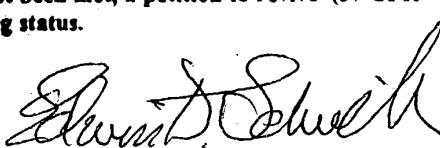
<input checked="" type="checkbox"/> The following fees are submitted:	CALCULATIONS PTO USE ONLY		
Basic National Fee (37 CFR 1.492(a)(1)-(5)): Search Report has been prepared by the EPO or JPO.....			
International preliminary examination fee paid to USPTO (37 CFR 1.482) ..... \$640.00			
No international preliminary examination fee paid to USPTO (37 CFR 1.482) but international search fee paid to USPTO (37 CFR 1.445(a)(2)).. \$710.00			
Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO..... \$950.00			
International preliminary examination fee paid to USPTO (37 CFR 1.482) and all claims satisfied provisions of PCT Article 33(2)-(4)..... \$90.00			
ENTER APPROPRIATE BASIC FEE AMOUNT = \$ 1,040.00			
Surcharge of \$130.00 for furnishing the oath or declaration later than <input type="checkbox"/> 20 <input type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.492(e)).			
Claims	Number Filed	Number Extra	Rate
Total 4 Claims	4 -20 -	-0-	X \$22.00 \$ -0-
Independent Claims	1 -3 -	-0-	X \$74.00 \$ -0-
Multiple dependent claims(s) (if applicable)			+ \$230.00 \$ -0-
TOTAL OF ABOVE CALCULATIONS = \$ 1,040.00			
Reduction by 1/2 for filing by small entity, if applicable. Verified Small Entity statement must also be filed. (Note 37 CFR 1.9, 1.27, 1.28).			
SUBTOTAL = \$ 520.00			
Processing fee of \$130.00 for furnishing the English translation later the <input type="checkbox"/> 20 <input type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.492(f)).			
TOTAL NATIONAL FEE = \$ 520.00			
Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). \$40.00 per property + \$ -0-			
TOTAL FEES ENCLOSED = \$ 520.00			
Amount to be: refunded \$ charged \$			

- a.  A check in the amount of \$ \*\*520.00 to cover the above fees is enclosed.
- b.  Please charge my Deposit Account No. \_\_\_\_\_ in the amount of \$ \_\_\_\_\_ to cover the above fees.  
A duplicate copy of this sheet is enclosed.
- c.  The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. 19-0450. A duplicate copy of this sheet is enclosed.

NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status.

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SIGNATURE

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NAME

31,459

REGISTRATION NUMBER

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POWER SAVING LEADS STATUS MONITORING

The present invention relates to the field of battery operated devices such as devices used for monitoring a cardiac patient's electrical cardiac activity and, in particular, to the operation of a power saving or sleep mode of an ECG acquisition system.

BACKGROUND TO THE INVENTION

In battery operated devices, power consumption is a very important technical characteristic. In order to reduce power consumed by the device, microcontrollers of devices, such as as ECG monitors, use a sleep mode whereby a minimal amount of energy is consumed from the battery.

Often automatic initiation of such a sleep mode and activation of the microcontroller for power and energy saving purposes is based on special requirements and criteria associated with the functionality of the device.

In the case of the ECG acquisition device, one of the important requirements is signal quality monitoring. If leads of the device are disconnected from a patient, no ECG can be acquired and the device can save power by using a sleep mode.

Similarly, the patient's compliance also dictates continuous monitoring of the leads status in sleep mode in order to automatically activate the device upon disconnection or connection of the leads.

Such a task requires at least some of the elements, such as front-end amplifiers, to be operational in sleep mode which means that there is an undesirable power drain from the batteries of known devices.

It would be advantageous to provide a method and apparatus which provides a power supply arrangement which prevents an undesirable power drain.

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### OBJECT OF THE INVENTION

It is an object of the present invention to provide a method and apparatus for power saving which substantially overcomes or ameliorates the above mentioned disadvantages.

### DISCLOSURE OF THE INVENTION

- 5 According to one aspect of the present invention there is disclosed a method of operating an acquisition and monitoring device which uses contact means to detect and acquire signals, said device having a sleep mode, a wake mode and an operational mode, said method including the steps of providing an auxiliary oscillator in said device to provide a periodic interrupt signal to wake the device from the sleep mode to the wake mode where power is supplied to the device is minimal, testing connection of contact means to said device after receipt of said periodic interrupt signal, initiating the sleep mode if no connection of contact means is detected or initiating the operational mode if connection of contact means is detected.
- 10

Preferably, the auxiliary oscillator is a low power, low frequency oscillator.

- 15 Preferably, the interrupt signal turns on front end amplifiers of said device and has a period of about 2 seconds.

Preferably, the test execution time is about 0.005 seconds.

### BRIEF DESCRIPTION OF THE DRAWINGS

- The present invention will be now be described with reference to the accompanying drawing in which:
- 20

Fig. 1 is a flow chart of the method of operation an acquisition and monitoring device.

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## BEST MODE OF CARRYING OUT THE INVENTION

The method according to the power saving system of the preferred embodiment uses a "sleep-wakeup-check-sleep" sequence for automatic activation of an ECG acquisition and monitoring device. When such a device is used to monitor a patient, it is important for the 5 device to know when the ECG leads are in contact with the patient's skin. If the leads are not in contact, the device is in a sleep mode.

The method includes the use of providing an auxiliary, low power, low frequency oscillator to generate an interrupt signal to "wake up" the microcontroller of the device. The timeout of the interrupt signal is preferably set to occur every few seconds.

- 10 On the interrupt condition, ie when the interrupt signal is generated, the microcontroller switches on power for front end amplifiers of the device, waits for a short settling time, tests leads status, (ie whether there is contact or not), and then initiates sleep mode if the leads are not in contact. These routines are preferably performed in a very short time period in comparison to the interrupt timeout period.
- 15 Thus the power saving system of the preferred embodiment monitors the status of the leads within periods defined by the interrupt timeout signals. With the interrupt timeout period being much longer than the time period of the leads status test, a sufficient ratio of sleep time to active time is achieved.

In the case where the timeout period is 2 seconds and the test execution time is 0.05  
20 seconds, the ratio is 1:40.

The foregoing describes only one embodiment of the present invention, and modifications obvious to those skilled in the art can be made thereto without departing from the scope of the present invention.

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## CLAIMS

1. A method of operating an acquisition and monitoring device which uses contact means to detect and acquire signals, said device having a sleep mode, a wake mode and an operational mode, said method including the steps of providing an auxiliary oscillator in said device to provide a periodic interrupt signal to wake the device from the sleep mode to the wake mode where power is supplied to the device is minimal, testing connection of contact means to said device after receipt of said periodic interrupt signal, initiating the sleep mode if no connection of contact means is detected or initiating the operational mode if connection of contact means is detected.
2. The method of operating an acquisition and monitoring device according to claim 1, wherein the auxiliary oscillator is a low power, low frequency oscillator.
3. The method of operating an acquisition and monitoring device according to claim 1, wherein the interrupt signal turns on front end amplifiers of said device and has a period of about 2 seconds.
4. The method of operating an acquisition and monitoring device according to claim 1, wherein test execution time is about 0.005 seconds.

## (12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization  
International Bureau



(43) International Publication Date  
21 December 2000 (21.12.2000)

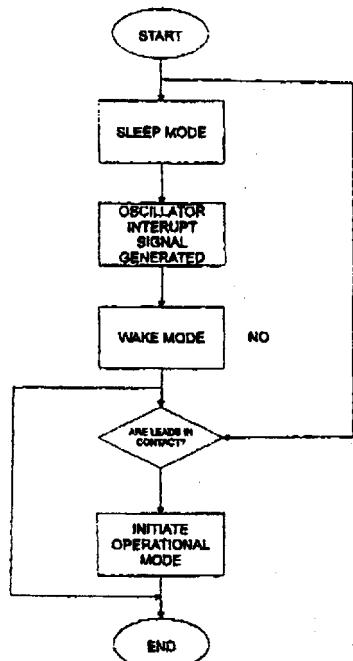
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**PQ 0886 10 June 1999 (10.06.1999) AU**
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- (74) Agent: **YOUNG, Philip, Claude, Wilson & Young, P.O. Box 553, Alexandria, NSW 1435 (AU).**
- (81) Designated States (national): **AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CR, CU, CZ, DE, DK, DM, DZ, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW.**
- (84) Designated States (regional): **ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).**

*[Continued on next page]*

## (54) Title: POWER SAVING LEADS STATUS MONITORING



(57) Abstract: A method of operating an acquisition and monitoring device which uses contact means to detect and acquire signals is disclosed. The device has a sleep mode, a wake mode and an operational mode, and the method includes the steps of providing an auxiliary oscillator in said device to provide a periodic interrupt signal to wake the device from the sleep mode to the wake mode where power supplied to the device is minimal, testing connection of contact means to said device after receipt of said periodic interrupt signal, initiating the sleep mode if no connection of contact means is detected or initiating the operational mode if connection of contact means is detected. Preferably, the auxiliary oscillator is a low power, low frequency oscillator and the interrupt signal turns on front end amplifiers of said device and has a period of about 2 seconds, while the test execution time is about 0.005 seconds.

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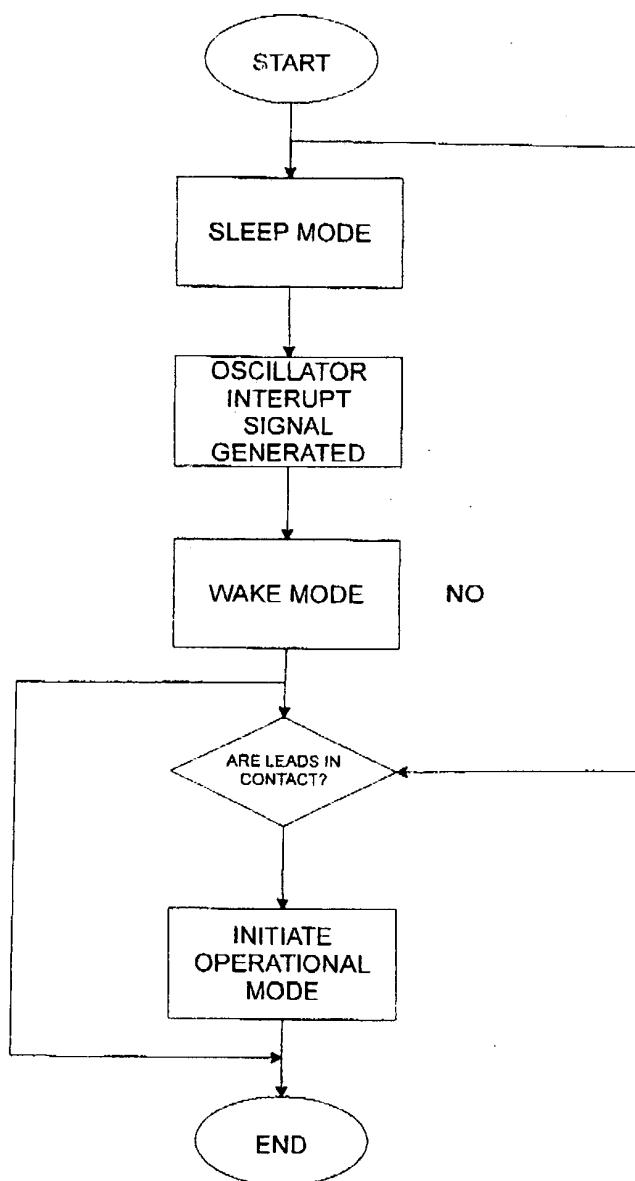


Fig. 1

# Declaration and Power of Attorney For Patent Application

## English Language Declaration

As a below named inventor, I hereby declare that:

first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled

### POWER SAVING LEADS STATUS MONITORING

the specification of which

(check one)

is attached hereto.

was filed on 9 June 2000 as

Application Serial No. PCT/AU00/00657 (assigned U.S.S.N. 10/009,908)

and was amended on \_\_\_\_\_  
(if applicable)

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to the examination of this application in accordance with Title 37, Code of Federal Regulations, §1.56(a).

I hereby claim foreign priority benefits under Title 35, United States Code, §119 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

Prior Foreign Application(s)			Priority Claimed	
PQ0886 (Number)	Australia (Country)	10 June 1999 (Day/Month/Year Filed)	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
			<input type="checkbox"/> Yes	<input type="checkbox"/> No
			<input type="checkbox"/> Yes	<input type="checkbox"/> No

I hereby claim the benefit under Title 35, United States Code, §120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, §112, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, §1.56(a) which occurred between the filing date of the prior application and the national or PCT International filing date of this application:

(Application Serial No.)

(Filing Date)

(Status)  
(patented, pending, abandoned)

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

**POWER OF ATTORNEY:** As a named inventor, I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and transact all business in the Patent and Trademark Office connected therewith. (*list name and registration number*)

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(Supply similar information and signature for third and subsequent joint inventors.)